Pada keadaan tunak (steady state)

$\frac{di_a(t)}{dt} = 0$ $\quad \frac{d\omega(t)}{dt} = 0$ semua konstan

(1) $0 = \frac{1}{L_a}(E_a - E_b - I_a R_a) \rightarrow E_b = E_a - I_a R_a$

(2) $0 = \frac{1}{J}(T - B\omega) \longrightarrow T = B\omega$

(3) $T = K_m I_a \rightarrow B\omega = K_m I_a$

$K_m = \frac{B\omega}{I_a}$, $I_a = \frac{B\omega}{K_m}$

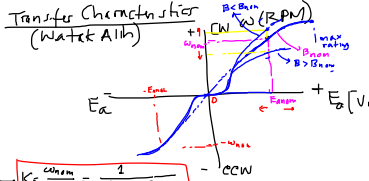
(4) $E_b = K_b \omega$

$K_b \omega = E_a - I_a R_a = E_a - \left[\frac{B\omega}{K_m}\right] R_a$

$(K_m K_b + BR_a)\omega = E_a$

Kecepatan nominal $\omega_{nom}\,[rad/sec] = K E_{anom}\,[Volt]$ $\rightarrow$ $K = \frac{\omega_{nom}}{E_{anom}} = \frac{1}{K_m K_b + BR_a}$

Transfer Characteristic (Watak Alih)



MODEL MATEMATIK

Hukum Ohm

$e_a(t) - e_b(t) = i_a(t) R + L \frac{di_a(t)}{dt}$

$\frac{di_a(t)}{dt} = \frac{1}{L}\left[e_a(t) - e_b(t) - i_a(t) R\right]$ ... (1)

Hukum Newton

$T(t) = J \frac{d\omega(t)}{dt} + B\omega(t)$ $\quad \omega$ omega, Ω : OMEGA

$\frac{d\omega(t)}{dt} = \frac{1}{J}\left[T(t) - B\omega(t)\right]$ ——— (2)

Sifat Motor

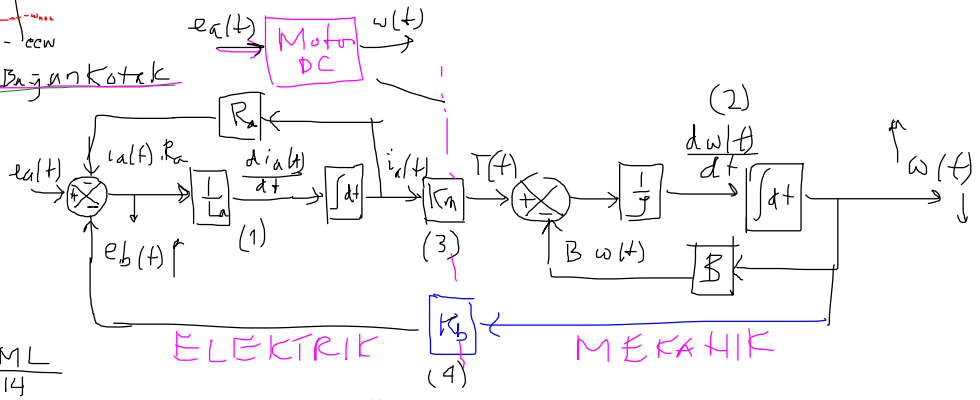
$T(t) = K_m i_a(t)$ ——— (3)

$K_m = \frac{T_{nom}}{I_{a\,nom}}$

Sifat Generator

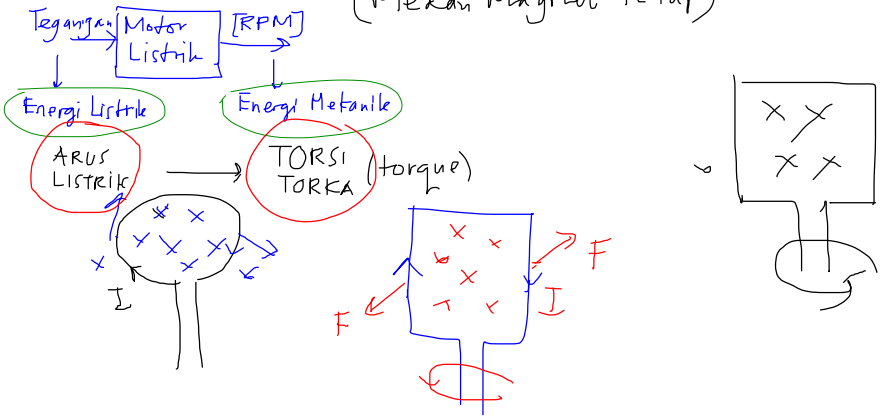
$e_b(t) = K_b \omega(t)$ ——— (4)

Bagan Kotak



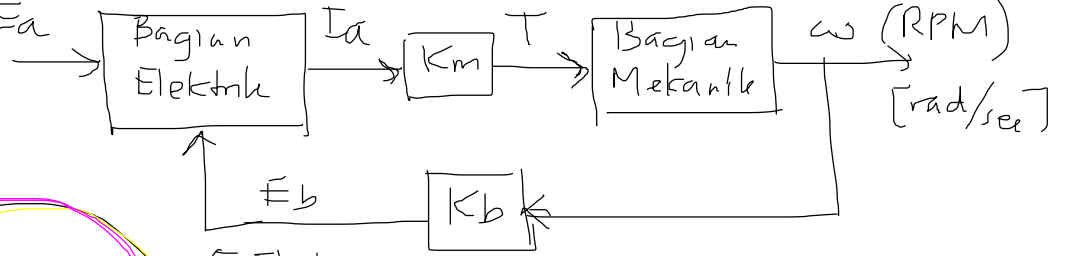
PPML
2014

* Pemodelan Motor DC Terkendali Jangkar (Medan Magnet Tetap)



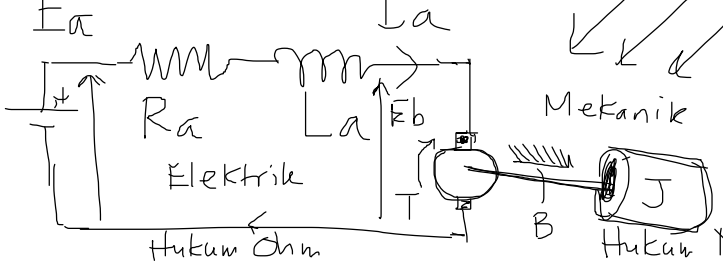
Tugas 1 : Type/Merk Data Sheet Motor.

* Kapasitas (HP, Watt)
* Nominal :
  - Ea, Ia, ω, B, T
  - Ra, La, J
  - Km, Kb



Model FISIK:

GGL lawan Back EMF



Tugas 2 (dikumpul 02/10/2014)

Dengan analisis transien menggunakan Tabel Laplace, tentukan SOLUSI ANALITIK dari:

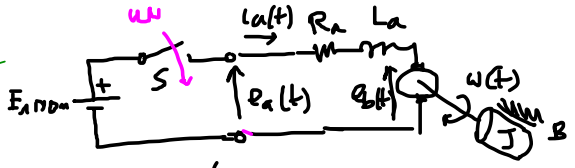
* $\omega(t) = \mathcal{L}^{-1}\,\omega(s) = \mathcal{L}^{-1}\,G(s)\,E_a(s)$
* $i_a(t) = \mathcal{L}^{-1}\,I_a(s) = \mathcal{L}^{-1}\,H(s)\,E_a(s)$

$E_a(s) = \mathcal{L}\,e_a(t) = \mathcal{L}\,E_{anom}\,u(t) = \dfrac{E_{anom}}{s}$

*Analisis Transien

Saklar S ditutup pada $t = 0$

$e_a(t) = E_{anom}\,u(t)$



$u(t)\begin{cases} = 0, & t < 0 \\ = 1, & t \geq 0 \end{cases}$ unit step function (isyarat undak satuan)

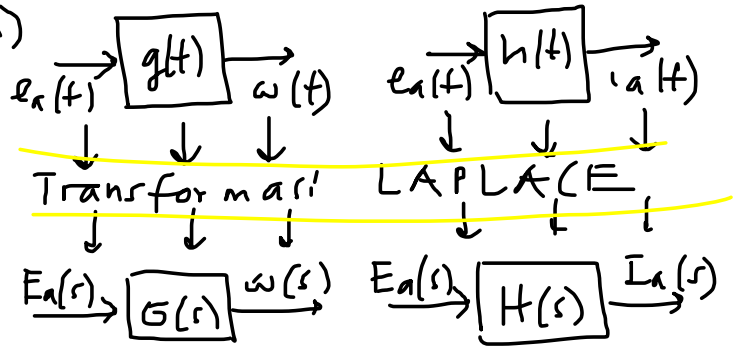
Model Nisbah Alih (Transfer Function)

$E_a(s) = \mathcal{L}\,e_a(t)$

$= \mathcal{L}\,E_{anom}\,u(t)$

$= E_{anom}\,\mathcal{L}\,u(t)$

$= \dfrac{E_{anom}}{s}$



$\omega(s) = G(s)\,E_a(s)$

$\omega(t) = \mathcal{L}^{-1}\,\omega(s)$

$I_a(s) = H(s) \cdot E_a(s)$

$i_a(t) = \mathcal{L}^{-1}\,I_a(s)$

$E_a(s) = \dfrac{E_{anom}}{s}$